Thesis/
Reports
Taylor, R.F

THE FOREST RESOURCES OF COLORADO

by

R.F. Taylor & E.M. Hornibrook

UNITED STATES DEPARTMENT OF AGRICULTURE

Forest Service

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A Preliminary Report of the
Rocky Mountain Forest and Range Experiment Station

March 15, 1937.

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R. F. Taylor and E. M. Hornibrook [1]

FOREWORD

The purpose of this report is to assemble under one cover the best information on the forest resources of Colorado now available. Accurate data were not always obtainable and many statements herein represent only rough approximations by informed persons. As rapidly as possible surveys will be made and more reliable information substituted for the estimates appearing in this progress report. Corrections and additions will be welcomed.

EARLY HISTORY OF COLORADO'S FORESTS

The twenty million acres of forests originally found in Colorado played an important part in the early development of the State by furnishing timber for mining, railroads, and agriculture. Previous to the discovery of gold and other minerals the few residents of Colorado made little demand upon the timber resources, but the population then increased rapidly and extensive railroad and mining developments in the seventies and eighties made heavy inroads on the more accessible forest stands. Wasteful cutting was general and the logging debris was the starting point of many large and destructive forest fires. The cutting of railroad ties, mine timbers, and lumber continued without restriction until the principal national forest areas were set aside in the late nineties and early nineteen hundreds.

1/ Acknowledgement is made of valuable suggestions and other assistance given by H. D. Cochran, U. S. Forest Service, Denver, Colorado; R. E. Ford, Extension Forester for Colorado; and W. J. Morrill, formerly State Forester of Colorado.

The Rocky Mountain Forest and Range Experiment Station is maintained by the U. S. Forest Service at Fort Collins, Colorado, in cooperation with the Colorado State College of Agriculture and Mechanic Arts.

The amount of timber cut annually increased until about 1904 when timber production, mostly from privately owned lands, reached its peak. The amount cut in 1909 nearly equaled the peak cut of 1904, but since that time production has fallen off materially. Under sustained yield management the national forests are building up a stable and permanent forest industry.

LOCATION OF COLORADO'S TIMBER

Approximately one-third of the State is forested. The Rocky Mountains rise abruptly to great heights, receiving a great deal more precipitation than the treeless lowlands to the east and to the west. It is on these better watered slopes that most of Colorado's forests are found.

The forests may be grouped into two general classes: (1) woodland, including the fringes of broad-leafed trees along the lower water courses and the rather extensive areas of pinon, juniper, and scrub oak in the zones of light rainfall in the foothills; (2) the timber zone, which includes forests composed chiefly of ponderosa pine, Douglas fir, lodgepole pine, and Engelmann spruce in irregular belts at increasing elevations in the order named. Intermingled with these major species are aspen, white fir, and blue spruce at the lower elevations; bristlecone pine, alpine fir, and corkbark fir at the higher elevations and at timberline; and limber pine scattered over the entire range.

FOREST AREA, VOLUME AND OWNERSHIP

Table 1 gives a summary of the forest area in Colorado by timber types and Tables 2 and 3 give the ownership of the principal timber types by acreage and volume. Figure 1 shows the approximate distribution of the timber types. Table 1 shows that there are nearly 20,500,000 acres of forest land in Colorado. Of this, an aggregate area of 15,561,000 acres is commercial forest, and the remainder is in restrictive ownerships in national parks, national monuments, or municipal watersheds, or is devastated by fire or uncontrolled logging or is of the scattered woodland type that produces no commercial forest commodities.

From Table 2,[2] summarized below, it may be seen that the ownership of the commercial forest area in Colorado is distributed about as follows:

Ownership	Percent of total area	
Federal Government		
National forests	65.00	
Indian lands	1.40	
Other Federal	14.40	
		80.80
State		1.00
County and municipal		0.20
Private		
Farm wood lot	12.40	
Other privately owned	5.60	
		18.00
		100.00

Table 3,[2] summarized below, indicates that the ownership by volume of the commercial forests in Colorado is:

Ownership	Percent of total saw timber		Percent of total cordwood	
Federal Government				
National forests	81.00		66.60	
Indian lands	-		0.90	
Other Federal	13.40		10.50	
		94.40		78.00
State		0.30		0.40
County and municipal		0.10		0.10
Private				
Farm wood lot	-		5.90	
Other privately owned	5.20		15.60	
		5.20		21.50
		100.00		100.00

These figures show with striking effect the small proportion of Colorado's commercial forests controlled by private interests. The importance of the national forests which contain 81 percent of the State's commercial saw timber and 73 percent of the State's combined saw timber and cordwood (by volume) is apparent.

It will be seen that the commercial forest land area in State or municipal ownership comprises but 1.2 percent of the total. Privately owned commercial forest land comprises 18 percent. Some of this

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2/ This is a summary only; the tables will be found on the last 6 pages of this pamphlet.

private land would undoubtedly fare better under public ownership, as it is being poorly managed. Some of the wood lots and a few areas of other privately owned lands could be handled by the owners as economic units, and efforts are being made by the part time State Extension Forester to obtain cooperation in that direction. Lack of a State Forestry Department since 1933 makes it difficult to push the acquirement of State Forests or to take aggressive action in the proper handling of private forest land. The lack of a State Forester prohibits Colorado from profiting through cooperation with the Federal Government under the Fulmer Act. However, a 70,000 acre State Forest is in process of establishment. A well-rounded program of forest management including this private land would result in a great increase in its production and greater economic stability for the owners. The Federal Government is spending a great deal in Colorado both on Government lands and in attempting to foster wood lot management and farm planting. The State contributes little to this program.

RELATIVE VALUE OF COMMERCIAL TIMBER SPECIES

The value of the different timber species varies from time to time depending upon market conditions and upon whether stumpage prices or retail trade prices for lumber or logs are made the basis for comparison. Table 4 gives the average (1935) stumpage and log prices for the important commercial timber species in Colorado.

On the basis of average prices given in Table 4 and the total volume by species as given in Table 3, the approximate total value of the standing saw timber of commercial species in Colorado is as follows: 3/

Species	Stumpage	Retail Value of Logs
Ponderosa pine	$ 14,294,000	$ 90,822,000
Lodgepole pine	22,617,000	117,697,000
Douglas fir	4,716,000	25,396,000
Engelmann spruce	69,760,000	432,044,000
All species	$111,387,000	$ 665,959,000

These figures include the value of the less important species which ordinarily occur in the major forest type indicated in the table; such as limber pine, bristlecone pine, white fir, alpine fir, and corkbark fir. They do not, however, include the value of forest products other than saw logs such as cordwood, posts, and mine props.

3/ Based on lumber tally at the mill. The timber is usually sold in the woods on the basis of log scale. The values by log scale would be about 15 percent less than those shown.

UNPRODUCTIVE FOREST LANDS

Table 1 shows that nearly 1.2 million acres of forest land in Colorado which have been deforested are not restocking satisfactorily. About 62 percent of this occurs on national forests. In the early development of the State uncontrolled cutting took place in the more accessible locations around mining centers and along streams where the products could be floated to railroads. Devastating fires started in the slashings left by lumbering and little or no attempt was made to control these fires, as they swept across the timbered slopes, until some town, ranch, or mining property was endangered. Even then the only attempt was to save the property and not the forest. Fire followed fire until the last vestige of vegetation was gone from many large areas. The loss of surface soil-binding material was followed by swift erosion when the storms came; surface soil was washed away, rocks were exposed, gullies were formed, and destructive floods followed. Few if any trees were left to re-seed these old burns, or if there was seed it fell on barren ground and seedlings could not gain a foothold. Today many of these devastated areas are the starting points of floods which destroy roads, wash out bridges, terrify the towns, and fill many reservoirs with silt.

Erosion control work is being arranged for on the national forests and the Soil Conservation Service is demonstrating methods on privately owned non-forest land, but on private forest land where 40 percent of the deforested area is not restocking, little is being done. A State Forestry agency could do much to help solve this problem on private forest lands.

These old sores heal very slowly. Under natural conditions and without man's help it may take hundreds of years for these denuded areas to become reforested. To obtain a vegetative cover which will safeguard roads, buildings, and reservoirs, and which will maintain an adequate domestic water supply, it will be necessary to resort to artificial regeneration to restock these once forested lands. The U. S. Forest Service has planted and seeded a total of 24,651 acres 4/ on the national forests in Colorado. Section 4 of the Clarke-McNary Act of June 7, 1924, provides for cooperation between State and Federal governments in distributing tree seed and seedlings to farmers and others for windbreaks and for reforestation. The State Extension Forester in cooperation with the U. S. Forest Service distributed 203,000 trees to land owners in 1936 but this was largely for windbreaks and grove plantings on the plains. Between 1910 and 1933 the State Forester distributed 1½ million forest tree seedlings to farmers, chiefly in eastern Colorado.

4/ Annual planting report, 1936. U. S. Forest Service, Region 2. Unpublished.

GROWTH AND DRAIN

The volume of timber in the State increases by growth of existing trees, natural seeding of denuded areas, and growth of consequent reproduction and by growth of plantations. It decreases as a result of lumbering, uncontrolled fire, insect infestations, and loss due to rot and old age.

Gross Annual Increment of Commercial Timber Species

Adequate data for a satisfactory estimate of the total annual growth in the forests of the State are not available. It is estimated, however, that Colorado grows annually 4 to 5 times as much timber as it cuts. Estimates of possible growth based upon slightly more intensive forest management (as of the year 1950) for the 15,561,000 acres of commercial forest land indicate that with more complete utilization and sustained yield management the forests of Colorado should produce approximately 748 million board feet annually.

Annual Timber Loss

Cutting. According to the Bureau of Census figures for 1935, a total of 47,557,000 board feet of timber was sawed by 151 reporting sawmills. This does not include such products as telephone poles, hewed ties, and mine timbers which do not pass through a mill. Such products represent a considerable proportion of the total volume of timber cut. This is substantiated by the figure of 47,919,000 board feet of timber products including poles, hewed ties, and mine timbers removed from National Forest land alone during the same period. The volume of cordwood, which the last available census figure of 1924 placed at 66,024 cords or about 33,000,000 board feet, should not vary greatly. It is therefore probable that the total annual cut of timber exceeds 100 million board feet.

The 1934 Census of Manufactures distributes the total sawmill cut of 49,494,000 by species as follows:

Species	Feet, Board Measure
Ponderosa pine	28,429,000
Lodgepole pine	7,113,000
Spruce	7,559,000
Douglas fir	5,541,000
White fir	723,000
Cedar	35,000
Cottonwood	94,000

Similar distribution for 1935 is not yet available.

Fire. The average annual timber loss caused by forest fires is relatively small compared with other States. The average acreage burned over and volume of timber destroyed annually is shown in Table 6.

The very small forest acreage burned over annually should be credited to the outstanding fire detection and suppression systems of the U. S. Forest Service and U. S. National Park Service and to the fire-mindedness of the general public. An outstanding feature of the Forest Service system is the wide-spread cooperative organization among local residents in and near the national forests. The county sheriffs have charge of fire suppression on lands not owned by the Federal Government.

Insects. No data are available from which timber losses caused by insects can be determined but it is believed that only small losses occur annually from this source. Drought conditions seem to favor the increase of timber-destroying insects and infestations of epidemic proportions are now feared in certain parts of the State. Recent investigations by the U. S. Bureau of Entomology and Plant Quarantine indicate that barkbeetles are increasing rapidly. Control measures conducted by the U. S. Forest Service involve the cutting, peeling, and burning of infested trees to destroy the broods. The number of trees treated in Colorado from 1933 to 1935 measures, in a way, the extent of barkbeetle infestations:

Year	Number of Trees Treated
1933	6,117
1934	15,387
1935	27,152

Although some work was done on privately-owned lands, most of the control measures were conducted on the national forests. No estimate of the amount of timber killed by defoliating and wood-boring insects is available.

Diseases. Tree diseases, such as mistletoe, rusts, and wood rots caused by fungi cause a great deal of damage in the aggregate. The damage is not noticeable to the same extent as that of fire and insect epidemics, but trees are killed here and there throughout the forests. Mistletoe retards tree growth and eventually may cause the tree's death. Wood rotting fungi are a strong contributing factor in losses due to breakage and windfall as they weaken trees so they can not withstand severe wind storms. No data are available from which the extent of timber losses due to fungi can be determined.

COLORADO'S PRESENT AND PROBABLE FUTURE TIMBER REQUIREMENTS.

It is estimated that the people of Colorado use annually 318 million board feet of timber. Since only about 100-125 million board feet are cut in the State it is evident that about two-thirds of the State's lumber requirements are shipped in from other states, chiefly

softwoods from the North Pacific region. However, considerable quantities come from the northern and southern Rocky Mountain states. The bulk of hardwoods come from the Lake States and central hardwoods region.

The species most commonly shipped in are ponderosa pine, Douglas fir and western red cedar. Ponderosa pine is utilized for rough construction, ceilings, sidings, partitions, and sash and door products. Douglas fir is used for flooring and structural timbers where strength and hardness are necessary. A great deal of Douglas fir veneer is used for interior finish. Western red cedar is largely used for power line poles, telephone poles and for shingles. Hardwood importations are mainly oak, ash, maple, and hickory for flooring, implements, and implement handles. Considerable quantities of hardwood veneers are imported for interior finish and furniture manufacture.

Practically the whole lumber production of the State is absorbed by local markets. The sawmills are mostly of the circular saw type producing rough lumber, a large part of which is dimension stock used locally for building purposes. Shingle and lath production is of minor importance. Pulp and paper production is negligible at present but the abundance of spruce timber in southwestern Colorado may foster such an industry in the future. No veneer and very little excelsior or baskets are produced in the State. In the last 10 years, since the advent of a suitable preservative treatment for lodgepole pine, the use of this species for poles and posts has increased enormously. It is estimated that Colorado produced 85,000 poles in 1931 and in 1930 the production from the national forests alone amounted to 32,839 poles. Hewed ties of lodgepole pine, ponderosa pine, and Douglas fir are mostly taken from private lands. The majority of the ties produced in the State, however, are sawed ties produced by portable sawmills. In 1923, 5,505,933 cubic feet of round mine timbers were produced in addition to 6,743,000 board feet of sawed mine timbers, The fuel wood produced in Colorado during 1924 was 66,024 cords. It is believed that these figures represent about the normal annual requirements for these products. No figures are available on the annual production of mine timber and fuel wood since 1924.

Colorado's timber requirements will probably increase gradually with an expected increase in population, industry, and manufacturing. It is estimated that under sustained yield management the forests of the State can produce enough timber to satisfy the requirements for local woods indefinitely. There is no immediate prospect of any development which might result in the cutting of the old-growth volume at a rate approaching the potential replacement through annual growth, except on small areas under scientific forest management. With nearly 95 percent of the merchantable timber volume of the State on Federal lands that are likely to come under increasingly intensive forest management, requirements for local timber should never be a problem.

THE PORTABLE SAWMILL

Colorado's commercial saw timber is largely scattered throughout the Rocky Mountains. The relatively small volume of timber to be taken from one drainage, transportation difficulties caused by the rugged topography, excessive costs of road construction, and the distance to markets necessitate the use of small sawmills. Ranchers and other residents of forest communities find woods work and the operation of small sawmills a welcome and profitable occupation during the seasons not occupied by farming and livestock raising. Woods work and lumber production provide the economic factor which makes possible the livelihood of many residents of the mountainous portions of the State. With these facts in mind any attempt at land-use planning must take into consideration the sustained-yield plan of forest management and the importance of small-mill timber operations.

During the past 8 years tractor logging and truck hauling have developed enormously and, partly as a result of this, the U. S. Forest Service is convinced that the best way to use the forests of Colorado continuously and profitably is by means of frequent selection and removal of merchantable trees, made possible by permanent roads reaching to all parts of the forest and by permanent forest communities. This will mean economic stability for the woods worker. The removal of unproductive trees at frequent intervals, sawing them in the woods by portable mills, and hauling them out on good roads by trucks, will result in much better growing conditions in the forest. Although this increased growth will probably never result in the production of dimension stock large enough or clear enough to compete with Pacific Coast softwoods it will result in some increase in size of clears and some increase in the selling price of lumber. At present most local pine is handled in lumber yards only in common grades, selling for about $30 to $33 per thousand board feet, whereas Pacific Coast Douglas fir in larger sizes and clearer stock brings $50 or $60 per thousand board feet.

CONSERVATION MEASURES

In the late eighteen hundres it was recognized that Colorado's forests were fast disappearing as a result of uncontrolled cutting and burning. Agitation for conservation of the natural resources resulted eventually in setting aside approximately 13,293,094 acres of publicly owned forest land and the development of the national forest system. These forests are valuable primarily for the production of timber, protection of watersheds, as sources of domestic and irrigation water supplies, and for grazing and recreation. The management of these publicly owned forests is so designated as to coordinate the development and use of all the natural resources in such a manner as to result in the largest public benefit.

Besides Federal action, the State encouraged the planting of trees by non-taxation of reforested areas for a certain number of years and the county sheriffs were charged with the responsibility of fire suppression on State and private lands.

Later, in 1933, the Lumber Code of the N.R.A. was designed to get private owners of forest land to regulate their cut so as to leave their lands in good condition for producing successive crops of trees.

The Resettlement Administration has a program of acquisition of marginal and sub-marginal farm lands on the headwaters of important streams with the intention of retiring these lands from cultivation and returning them to timber and forage production.

At least two municipalities in the State have acquired and fenced their watersheds to prevent cutting of timber and exclude grazing in an attempt to maintain their domestic water sources in the highest productive condition.

The U. S. Forest Service has a program of range management designed to develop and maintain the forest ranges in the most productive condition possible consistent with utilization of the forage resources and control of erosion. Grazing is either restricted or entirely eliminated on some important watershed areas. The Forest Service also has a program of timber management designed to harvest the timber crop of the national forests at maturity yet maintain the land in a permanently productive condition, protect the watersheds, and reduce erosion to a minimum.

The Forest Service has carried on a program of land acquisition whereby land or timber is exchanged with private owners for land of equal value for the purpose of consolidating holdings within the exterior boundaries of the national forests and to protect important watersheds. Cut-over lands acceptable for such exchanges must be left by the private owner in suitable condition for permanent production of timber crops.

Since the inauguration of the C.C.C. the Forest Service has emphasized erosion control on forest lands. On areas where erosion is far advanced check dams have been constructed, stream bottoms and banks have been planted with soil-binding shrubs and trees, slopes have been terraced and revegetated, and hundreds of acres have been reforested by planting.

FORESTRY AND LAND USE PLANNING

In recent years a great deal of emphasis has been placed upon "land use planning." The economic stability of local communities is dependent to a large degree upon proper use of the soil. The Colorado State Planning Commission was created in 1934 to study the land use and water resources of the State and to make recommendations. The final report of this committee has not yet been made.

It is estimated that there is practically no land in Colorado now devoted to forestry which eventually should go into agriculture. However, it is estimated 5/ that in Colorado there are 18,388 acres of Federally-owned land and 90,960 acres of privately-owned farm land which is reverting or is likely to revert to forest land.

The problem of wise utilization of land for forests is entwined with the problem of agricultural land utilization in a number of ways: (1) In land use planning it is desirable to compare the economic feasibility of agricultural expansion with forest production. Large areas of farm lands unsuitable for growing cultivated crops might more profitably be devoted to forest production. (2) In many localities the use of marginal and sub-marginal lands for continuous timber production would increase economic stability by providing a market for farm crops and give supplementary employment to the people. (3) The management of farm wood lots and shelterbelts is closely related to general farm economy. (4) The rate of soil erosion, the control of floods, the adequacy of water supply in irrigated sections, and the losses due to silting of reservoirs and ditches are affected to a large degree by the location and condition of forest lands.

The benefits of forestry apply to the farmer as well as to the logger, lumberman, and other citizens of the State. Agriculture is a heavy consumer of forest products. Farm dwellings, barns, sheds, fences, fence posts, boxes, barrels, crates, implements, wagons, and tool handles are made of wood. Annual repairs and replacements require more wood. The fuel on many farms is chiefly wood. Moreover, in irrigated sections agriculture depends on an adequate supply of water and forests benefit agriculture by steadying the flow of water through streams, springs, wells, and irrigation systems. Without a dependable water supply thousands of acres in Colorado's richest agricultural sections could not be successfully farmed. The sugar industry, for example, would be wiped out entirely.

Forests thus contribute to the farmer's welfare and income through supplying domestic and irrigation water, regulating stream flow, reducing the expense entailed in removing silt from reservoirs and ditches, and perhaps the expense of building new dams. The farmer's income is increased through the sale of timber from farm wood lots and through the woods work available on adjacent forest lands.

5/ 1932. The Forest Situation in the United States: A Special Report to the Timber Conservation Board. (Mimeographed)

His expenses are reduced through the production of posts, poles, and fuel. Local forest industries increase the market for farm products and help carry the tax burden. Forests help protect the farm from wind and storm and against damage by erosion.

IMPORTANCE OF FORESTS FOR GRAZING

Water for domestic use, irrigation, and livestock is the factor which definitely limits the habitation of large areas in both eastern and western Colorado. The headwaters of four great rivers, Rio Grande, Colorado, Arkansas, and Platte, originate within the forests of Colorado. Over large areas of this forest land a thick blanket of snow accumulates each year and it is the function of the forest cover to retard the rate of melting when spring temperatures rise and the blanket of snow begins to disappear. If the vegetative cover is destroyed snow melts rapidly, and run-off and erosion are accelerated. The greater part of the forested area is used as range for livestock, a use which can easily destroy the vegetative balance and unless this use is well planned the effectiveness of the watershed cover may be seriously reduced.

In many parts of Colorado the mainstay of agriculture is the production of meat, hides, and wool. The home range or ranch is too small to maintain the stock on a year-round basis so the rancher puts his stock on the forest ranges for part or most of the year and produces hay and grain on his cropland to carry the stock over the winter. Without the facilitating range land on the adjacent national forests, many a small stockman would have to go out of business. Under skillful management the forests of Colorado can furnish range for large numbers of livestock, at the same time producing timber, protecting watersheds, and guarding against accelerated erosion.

RECREATION

Recreation is a valuable service rendered the people of the State and its visitors by the forests of Colorado but it is difficult to estimate the value of this use in dollars and cents. Hundreds of thousands of people flock to the national parks during the summer months. Over a million and a half people used the national forests in Colorado for recreation during 1935, according to a report compiled by Regional Forester Allen S. Peck. Of these, 1,267,350 were picnickers, 20,515 were hotel, resort, and cabin guests, and 158,410 were over-night campers. Most of the campers used the improved camp grounds that have been developed during the past few years by CCC crews. Hiking and mountain-climbing clubs have been organized to take advantage of opportunities offered by Colorado's forests and mountains.

Figures based upon estimates of rangers, the State Highway Department, the Bureau of Public Roads, and hotel and resort proprietors indicate that about 3 million motorists drove through the forests of Colorado on business or pleasure during 1935. The recreational use of the forests no longer ends with the close of the fishing and hunting seasons. Interest in skiing and other winter sports continues the recreational use throughout the year. This increasing interest in winter sports and skiing tournaments may develop a winter sports center in Colorado similar to that which has developed at Lake Placid in New York. The Colorado mountains have the scenery, the terrain, the lakes, the snow and ice necessary for this purpose.

WILD LIFE A FOREST RESOURCE

The forest land of Colorado is the habitat of most of the big game animals of the State and is the water source for its fish-bearing streams. The 1935 estimates of the U. S. Forest Service show the number of big game animals in Colorado as follows:

Game	Number on the national forests	Number outside the national forests	Total
Antelope	45	167	212
Bear	3,427	258	3,685
Deer	59,495	15,815	75,310
Elk	13,505	2,572	16,077
Mountain sheep	2,302	438	2,740
	78,774	19,250	98,024

These figures indicate the importance of the forests of Colorado as a big game hunting ground. According to the Colorado Yearbook for 1933-1934 there are 3,417,818 acres of land in Colorado which have been set aside as game refuges. Of this 2,642,280 acres are State-owned lands, 418,178 acres are national forest lands under administrative restrictions, and 357,360 acres are Federally owned but outside the national forests. The importance of obtaining suitable supervision of wildlife management on so large an acreage is apparent.

PROBLEMS TO BE SOLVED

Some of the problems involved in better forest practice in Colorado necessitate legislation in order to remove non-productive, misused lands from private ownership. Others will be solved by more intensive management, well coordinated plans of cooperating governmental agencies, and research. In brief, Colorado's forest land problem

calls for proper management by Federal Government, State, and private owners to maintain the land in a highly productive condition so as to obtain repeated forest crops, protect the soil from erosion, safeguard watersheds, and retain esthetic and recreational values.

The forestry schools in Colorado are the only agencies outside of the U. S. Forest Service that have been even moderately active in attempting to solve these problems in the past. The forestry department at Colorado College was closed in 1934 and neither that school nor the forestry department of the Colorado State College of Agriculture and Mechanic Arts has been able to do very much research. Some experimental work in forest management has been going on under the supervision of the U. S. Forest Service since 1909 but until its Rocky Mountain Forest and Range Experiment Station was organized in 1935 forest research on a comprehensive scale was not possible.

Forest research faces an enormous task. Before adequate forest management plans can be made, complete information must be procured as to the rate of timber growth by each species and under various degrees of cutting and soil fertility. A complete inventory of Colorado's timber resources, both public and private, must be made. Information about its future timber, range, and water requirements must be gathered. The problem of a fair and equitable apportionment of the tax burden must be solved. With these facts at hand, sustained yield forest management plans can be developed for logical timber production units and the forest communities may enjoy the stabilizing advantages attending such management of forest property, which are: (1) establishment of a permanent and contented labor supply which does not fluctuate with the seasonal occupations; (2) establishment of permanent markets; (3) development of permanent financial connections which facilitate business transactions; (4) the development of both public and private improvements on a permanent basis.

The ownership of insufficient area and the unregulated condition of many forest properties are obstacles to successful, sustained yield forest management. Nevertheless under such conditions, sustained yield may be successfully effected in the following ways: (1) public acquisition of additional forest land; (2) mergers of privately owned timber land made solely for the purpose of sustained yield forest management and not for the purpose of financial and market control; and (3) the coordination of both public and private timber lands which conform to natural timber producing units and the cooperative management of these forest lands on a sustained yield basis, each property contributing its share to the whole and receiving its share of the income. The coordination of public and private timber lands seems to be most likely to succeed. The U. S. Forest Service has already taken steps to ascertain what lands, both privately and publicly owned, might be so advantageously managed.

TABLE 1.- PRESENT AREA OF FOREST LAND IN COLORADO [1/]

Kind of forest land	Ponderosa pine	Lodgepole pine	Douglas fir	Engelmann spruce	Aspen	Total
	Acres	Acres	Acres	Acres	Acres	Acres
Commercial	3,459,000	2,491,000	1,439,000	4,101,000	4,071,000	15,561,000
Non-commercial	(Not available by types)					3,393,978
Non-commodity	(Not available by types)					314,724
Deforested, non-restocking	287,000	148,000	175,000	416,000	135,000	1,161,000
						20,430,702

1/ Based on unpublished figures of the U. S. Forest Service.

TABLE 2.- PRESENT OWNERSHIP OF FOREST LAND IN COLORADO 1/

Ownership	Forest type						
	Ponderosa pine	Lodgepole pine	Douglas fir	Engelmann spruce	Aspen	Unknown	Total
	1,000 acres	1,000 acres	1,000 acres	1,000 acres	1,000 acres	1,000 acres	1,000 acres
FEDERALLY OWNED AND MANAGED							
National forest							
Commercial	1490	1917	629	2936	1728	-	8700
Non-commercial	-	-	-	-	-	271	271
Non-commodity	-	-	-	-	-	2	2
Deforested,non-restocking	49	120	103	394	77	-	743
Indian lands							
Commercial	182	-	-	-	-	-	182
Non-commercial	-	-	-	-	-	-	-
Non-commodity	-	-	-	-	-	-	-
Deforested,non-restocking	2	-	-	-	-	-	2
Other Federally owned							
Commercial	617	207	268	845	-	-	1937
Non-commercial	-	-	-	-	-	2351	2351
Non-commodity	-	-	-	-	-	163	163
Deforested,non-restocking	-	-	-	-	-	-	-
All Federally owned	2340	2244	1000	4175	1805	2787	14351
STATE OWNED AND MANAGED							
Commercial	56	55	12	21	2	-	146
Non-commercial	-	-	-	-	-	18	18
Non-commodity	-	-	-	-	-	-	-
Deforested,non-restocking	4	4	1	1	-	-	10
All State owned	60	59	13	22	2	18	174
COUNTY AND MUNICIPAL							
Commercial	16	3	-	4	-	-	23
Non-commercial	-	-	-	-	-	8	8
Non-commodity	-	-	-	-	-	16	16
Deforested,non-restocking	1	-	-	-	-	-	1
All county and municipal	17	3	-	4	-	24	48
PRIVATELY OWNED							
Farm wood lots							
Commercial	-	-	-	-	1662	-	1662
Non-commercial	-	-	-	-	-	-	-
Non-commodity	-	-	-	-	-	-	-
Deforested,non-restocking	-	-	-	-	-	-	-
Other privately owned							
Commercial	1098	309	530	295	679	-	2911
Non-commercial	-	-	-	-	-	746	746
Non-commodity	-	-	-	-	-	133	133
Deforested,non-restocking	231	24	71	21	58	-	405
All privately owned	1329	333	601	316	2399	879	5857
Total, all ownerships	3746	2639	1614	4517	4206	3708	20430

1/ Based on unpublished figures of the U. S. Forest Service.

TABLE 3.- SAW TIMBER AND CORDWOOD VOLUMES ON PRESENT COMMERCIAL FOREST LAND IN COLORADO [1]

Ownership	Forest type [2]											
	Ponderosa pine		Lodgepole pine		Douglas fir		Engelmann spruce		Aspen		Total	
	Saw timber	Cord-wood	Saw timber	Cord-wood	Saw timber	Cord-wood	Saw timber	Cord-wood	Saw timber	Cord-wood	Saw timber	Cord-wood
	Million bd. ft.	M. [3] cords	Million bd. ft.	M. cords	Million bd. ft.	M. cords	Million bd. ft.	M. cords	Million bd. ft.	M. cords	Million bd. ft.	M. cords
FEDERALLY OWNED AND MANAGED												
National forests	2957	3577	6981	13156	1494	2766	26819	25523	628	11256	38879	56278
Indian lands	-	738	-	-	-	-	-	-	-	-	-	738
Other	2129	2160	1170	1129	1667	1533	1510	4049	-	-	6476	8871
All Federally owned	5086	6475	8151	14285	3161	4299	28329	29572	628	11256	45355	65887
STATE OWNED AND MANAGED	48	100	75	137	11	25	44	78	-	3	178	343
COUNTY AND MUNICIPAL	27	40	10	15	-	-	22	27	-	-	59	82
PRIVATE												
Farm wood lots	-	-	-	-	-	-	-	-	-	4987	-	4987
Other	580	3125	463	1461	456	1469	916	1324	97	5880	2512	13259
All privately owned	580	3125	463	1461	456	1469	916	1324	97	10867	2512	18246
TOTAL, ALL OWNERSHIPS	5741	9740	8699	15898	3628	5793	29311	31001	725	22126	48104	84558

1/ This table is based on "lumber tally" and is 15-20% above usual log scale. From unpublished data of the U. S. Forest Service.

2/ Type named for preponderant species; volume includes some other species in mixture.

3/ M = 1000. NOTE: Cordwood volumes include as cordwood small trees, tops, and limbs of saw timber areas as well as material from cordwood areas.

TABLE 4.-PRICES PER THOUSAND FEET BOARD MEASURE OF SOFTWOOD STUMPAGE AND LOGS, COLORADO, 1935. 1/

Species	Stumpage prices		Logs	
	Average, all sales	Price range, all sales	Average, all sales	Price range, all sales
Ponderosa pine	$2.49	$1.50-$3.50	$15.82	$4.00-$18.00
Lodgepole pine	2.60	1.66- 3.50	13.53	6.00- 15.00
Engelmann spruce	2.38	1.66- 4.00	14.74	7.00- 18.00
Douglas fir	1.30	1.00- 3.00	7.00	
White fir	1.58	1.50- 2.00	16.00	
Average, all species	2.26	1.00- 4.00	15.01	4.00- 18.00

1/ Cottonwood is the only hardwood species reported. This sold at an average stumpage price of $1.29 with a price range of $1.00-$4.00.

TABLE 5.- POSSIBLE ANNUAL GROWTH OF TIMBER ON COMMERCIAL FOREST LANDS IN COLORADO [1/]

Ownership	Ponderosa pine		Lodgepole pine		Douglas fir		Engelmann spruce		Aspen		Total area all types	Average growth all types per acre
	Area	Growth per acre	Area	Growth per acre	Area	Growth per acre	Area	Growth per acre	Area	Growth per acre		
	1000 acres	cubic feet	1000 acres	cubic feet	1000 acres	cubic feet	1000 acres	cubic feet	1000 acres	cubic feet	1000 acres	cubic feet
FEDERALLY OWNED AND MANAGED												
National forests	1490	6.67	1917	8.65	629	6.22	2936	11.34	1728	6.73	8700	8.66
Indian lands	182	5.27									182	5.27
Other	617	2.37	207	3.04	268	2.74	845	5.93			1937	4.05
STATE OWNED AND MANAGED	56	5.17	55	9.31	12	4.65	21	15.41	2	9.52	146	8.22
COUNTY AND MUNICIPAL	16	3.12	3	4.28			4	14.14			23	5.10
PRIVATE												
Farm wood lots									1662	9.52	1662	9.52
Other	1098	5.53	309	10.32	530	4.72	295	20.17	679	8.41	2911	8.05
ALL OWNERSHIPS [2/]	3459	5.4	2491	8.4	1439	5.0	4101	10.9	40.71	8.1	15561	8.01

1/ Based on more intensive forest management expected to be practiced by the year 1950. From unpublished data of the U. S. Forest Service.

2/ Total areas and weighted averages.

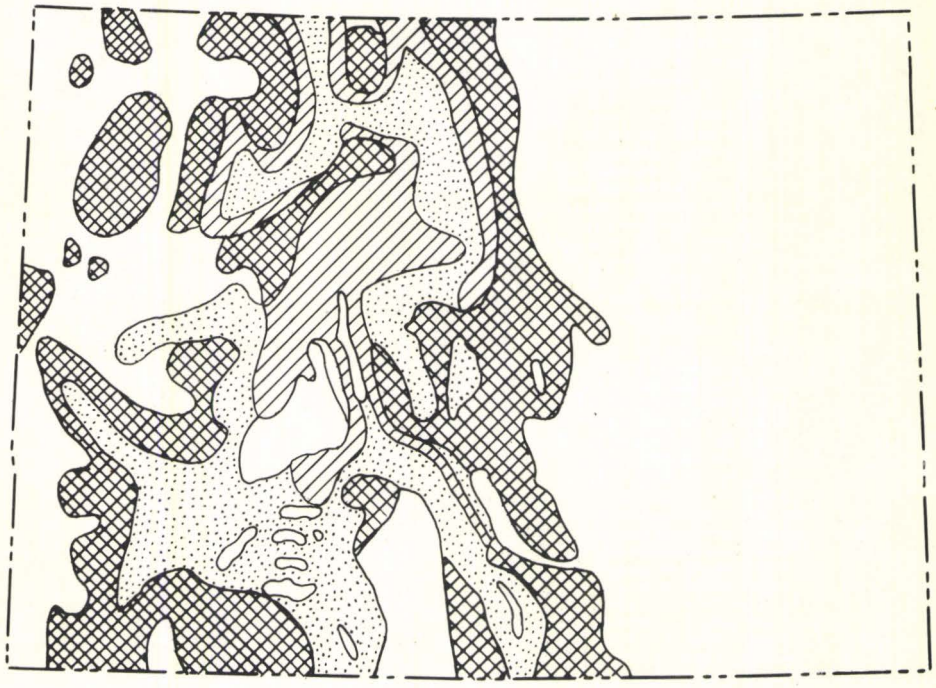
TABLE 6.- TIMBER ANNUALLY DESTROYED BY FIRE IN COLORADO. 1/

Class of timber	Ownership					
	Private			Public		
	Acres	M.ft.b.m.	Cords	Acres	M.ft.b.m.	Cords
Old growth						
Commercial timber areas	54	43	55	156	231	265
Cordwood areas	19	-	-	13	-	-
Second growth						
Commercial timber areas	202	37	50	164	17	65
Cordwood areas	145	-	353	269	-	374

1/ 1932. The Forest Situation in the United States: A Special Report to the Timber Conservation Board. (Mimeographed)

FIGURE - 1

APPROXIMATE DISTRIBUTION OF IMPORTANT TREE SPECIES IN COLORADO*



LEGEND

Ponderosa Pine

Lodgepole Pine

Engelmann Spruce

Scale 1 inch = 80 miles

Note:

*Unmerchantable stands and sparse woodland types are included. Prepared from best available information by R.F. Taylor - March 1, 1937